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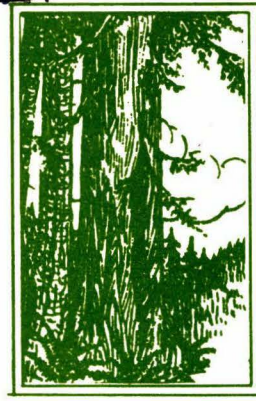

FOREST RESEARCH NOTES

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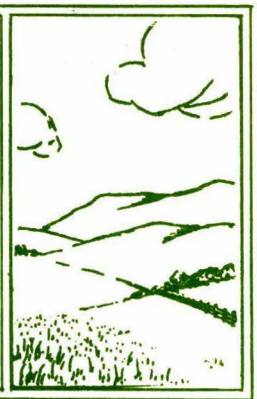

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SOME OBSERVATIONS ON THE SEEDFALL OF SUGAR PINE

By

H. A. Fowells

Forester

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SOME OBSERVATIONS ON THE SEEDFALL OF SUGAR PINE

By H. A. Fowells

Increasing interest in the management of sugar pine (Pinus lambertiana Dougl.) in the mixed-conifer stands of the west slope of the Sierra Nevada has pointed out the need of certain silvical knowledge. One bit of required knowledge is the area that can be seeded effectively by a sugar pine tree. The forest manager must have this information in marking a stand to obtain natural reproduction of sugar pine.

Observations by Siggins[1/] give some notion of the horizontal distribution of seed. He found that sugar pine seed fell at the average rate of 8.7 feet per second in still air. Given the distance of fall and the wind velocity over the path of fall, the horizontal travel of falling seed can be computed. As wind velocity within the forest is extremely variable[2/], any estimates of seed distribution based on assumed wind movements would no doubt be subject to large errors. Such estimates, however, can be used to set limits of seedfall. For example, seed falling 100 feet with an average wind velocity of 10 miles per hour theoretically would travel 169 feet horizontally. In view of the usually low wind velocities, such a distance may represent the upper limits of seed distribution.

This report concerns data collected at the Stanislaus Experimental Forest, California Forest and Range Experiment Station, on the actual distribution of sugar pine seed and on the amount of such seed necessary for natural reproduction.

1/ Siggins, Howard W. 1933. Distribution and rate of fall of conifer seeds. Jour. Agr. Res. 47: 119-128.

2/ Fons, W. L. 1940. Influence of forest cover on wind velocity. Jour. Forestry 38: 481-486.

How Seed Distribution was Measured

To sample the distribution of seed from individual trees, seed traps were placed around three isolated sugar pine trees in 1941, a year of heavy seed production. The selected trees were long-crowned, 40 to 50 inches d.b.h., and 150 to 175 feet in height. They bore an average of about 150 cones apiece.

The seed traps, slightly less than 3 feet square, were exposed at the rate of 2 per square chain. To effect the location, 4 annuli, or concentric zones, of 8 square chains each were described around each tree, using radii of 1.59, 2.26, 2.76, and 3.19 chains. Then the circular area of 3.2 acres surrounding each tree was divided into octants. This division made 32 chain-square segments, within each of which two traps were located by random azimuths and distances.

Seeds falling in the traps were counted at 10-day intervals in October. All seeds were cut to determine soundness, and the distribution of sound seed only is reported.

How the Seed was Distributed

Sound seed, which constituted 91 percent of the total, fell on the 3.2 acres surrounding each tree at the average rate of 8,250 seed per acre. However, seedfall was concentrated close to the tree; 65 percent was in the first zone, and the remainder was about equally distributed in the three outer zones:

Zone	Radial distance chains	Seed per acre
First	0 - 1.59	21,400
Second	1.59 - 2.26	3,650
Third	2.26 - 2.76	4,300
Fourth	2.76 - 3.19	3,650

As to direction of fall, the seed was distributed fairly uniformly around the trees, despite strong east to northeast winds in one day of the first counting period. On the average, the proportion of seed falling in each octant was:

Octant	Proportion of total, percent
North northeast	9
East northeast	14
East southeast	7
South southeast	11
South southwest	21
West southwest	11
West northwest	17
North northwest	10

Of the total seed trapped, 78 percent had fallen by the first count, October 9; 17 percent in the next 10 days, and 5 percent in the last 10 days.

How Much Seed is Needed?

Large amounts of seed seem to be necessary to obtain relatively few seedlings even when favorable soil conditions are prepared before seedfall. In 1948 the California Station conducted a logging experiment,[3/] designed specifically for natural reproduction of sugar pine. Sound sugar pine seed fell on the test area at the rate of 29,000 per acre. On the basis of counts on 680 milacre quadrats, sugar pine seedlings germinated at the rate of 707 per acre. The area was treated to control rodents.

Other tests showed similar results. In 1941, sugar pine seedlings germinated at the rate of 139 per acre on bare mineral soil after sound seed fell at 10,600 per acre. In 1936, another good seed year, seed trap counts indicated that sugar pine seed was distributed at the rate of 29,100 seed per acre on one brushy, cut-over plot and 5,100 seed per acre on another. Seedlings were found the year after at the rate of 240 and 20 per acre respectively.

If these data are indicative of the amount of seed necessary to obtain a few hundred natural seedlings, then only within a radius of about 100 feet of the study trees was enough seed dispersed. In clearings much more than 100 feet from a seed tree natural regeneration of sugar pine may be scanty even in heavy seed years.

3/ Dunning, Duncan. 1949. In, A sugar pine regeneration experiment. West Coast Lumberman 76(3): 62, 64.